NATURAL CHROMITE LACEWORK STRUCTURES IN ALLENDE. R. M. Housley, Condensed Matter Physics, Caltech, Pasadena CA 91125. rhousley@its.caltech.edu

Introduction: A strikingly high abundance of submicrometer chromite in Allende acid residues was discovered by Lewis et al in 1975 [1] during early efforts to isolate the carriers of anomalous inert gas components in this meteorite. Subsequent work showed that this chromite is not a significant inert gas carrier, but left its origin and significance unexplained. Housley and Clarke [2] used STEM techniques to image and analyze 20 of these chromite grains and found that they are rounded and irregular in shape and vary widely in composition. They also noted that at least after the acid treatments necessary to isolate them, they contain considerable ferric iron. Housley [3] used Mossbauer spectroscopy to confirm the presence of ferric iron and showed with SEM study of polished sections that much of this chromite occurs along what appear to be healed cracks in chondrule olivine grains. He also pointed out that yields imply that at least 20% of the total chromium in Allende must be incorporated in these small grains. A new SEM study involving freshly fractured Allende surfaces was begun a couple of years in parallel with a Mossbauer investigation of synthetic Fe-rich pentlandites and pentlandite in Allende [4].

Observations: The new SEM work immediately confirmed the ubiquitous presence of Cr-rich regions along healed cracks in chondrule olivines. Surprisingly it also revealed the abundant presence of Cr-rich lacework structures in pores in the matrix and pores along the surfaces of chondrules. A number of images of these laceworks are available on the web at my Allende pentlandite site http://members2.clubphoto.com/robert201572/30310/guest.phtml. Additional Anaglyph red/blue stereo images are available at http://members2.clubphoto.com/robert201572/30306/guest.phtml. Minerals commonly found in association with these laceworks besides pentlandite include whitlockite and Fe-rich olivine. The individual grains in the laceworks appear to be rounded and irregular in shape. The laceworks themselves do not show a discernable geometric structure.

Interpretation: The irregular shapes of the grains and the lack of a geometric pattern in their arrangement seem to rule out direct crystallization from a vapor as the origin of these laceworks. Although it might be hypothetically possible that such laceworks could form by the agglomeration of grains in space such an origin also does not seem plausible. The only apparent alternative seems to be to infer that they formed by precipitation or segregation on surfaces in material that is no longer present. That in turn implies considerable mass transport took place in Allende under tranquil conditions after it was assembled. Implications with respect to parent body versus nebular processing will be discussed.

References: [1] Lewis R. S. et al. (1975) *Science 190,* 1251-1262. [2] Housley R. M. and Clarke D. R. (1980) *LPS XI*, 945-958. [3] Housley R. M. (1981) *LPS XII*, 1069-1077. [4] Hoffman E. et al. (2001) *32nd LPS Conference.*